

TITLE OF INVENTION

**PRESSURE PULSE  
COMMUNICATION IN AN  
ENGINE INTAKE MANIFOLD**

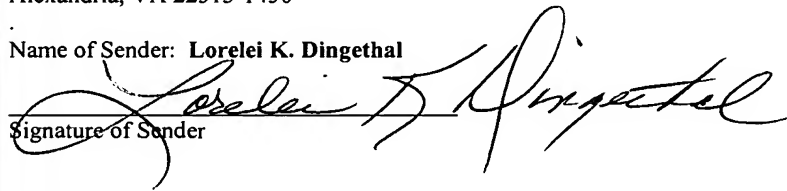
INVENTORS:

**ROBERT D. KELLER  
MARC H. SANDERSON  
KEVIN PETRI  
ROBERT J. BOYCHUK**

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## TITLE OF INVENTION

[0001] Pressure Pulse Communication In An Engine Intake Manifold.

## BACKGROUND OF THE INVENTION

[0002] The present invention relates to servo operated valves and particularly servo operated rotary valves for use in an engine to control pressure pulse communication between different channels in an engine inlet manifold.

[0003] In the design and manufacture of engines for passenger cars and light trucks, it has been found desirable to provide alternate runners or channels in the engine inlet manifold for providing pressure pulse communication at different rates according to the engine operating speed and load. In particular it has been desired to prevent pressure pulse communication for use at low speeds and low loads; whereas for high speed or high loads it has been required to allow pressure pulse communication.

[0004] In known production engines for light vehicles, an electrically operated rotary vane valve has been employed in the engine manifold to control the opening and closing of such additional or secondary passages as required by the engine operating conditions. Such valves are typically installed through an access opening in the manifold to position the rotary vane at the inlet end of the secondary passages with the vane contacting a rib or stop surface provided in the manifold, for example, by integral molding therein. However, in view of the variation in dimensions between the parts and the variation in the positioning of the valve vane upon assembly into the manifold, it has been found difficult to provide a valve installation which eliminates pressure pulse communication in the secondary passages when the valve vane is in the closed position. This problem is particularly aggravated by the nature of the valve construction because it is required that the servo motor actuator for the valve be disposed externally of the airflow passage in the manifold. The valve must be assembled through an access opening in the manifold rather than built in during forming of the manifold.

[0005] Thus, it has been desired to provide an inexpensive relatively simple and easy to install diverter valve for an engine air inlet manifold which prevents residual pressure pulse communication in the secondary passages when the valve is in the closed position.

#### BRIEF SUMMARY OF THE INVENTION

[0006] The present invention provides a solution to the above-described problem and presents an assembly of a servo motor and rotary vane valve adapted for installation through an access opening in an engine air inlet manifold and has provisions on the vane for the baffling surface to break up pressure pulses around the vane when the valve is in the closed position for the intended passage in the manifold. The valve vane may be integrally formed with an offset surface or flap which provides the baffling surface when the vane is in the closed position with respect to a rib or stop provided in the inlet passage.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a perspective view of the valve assembly of the present invention;

[0008] FIG. 2 is a view similar to FIG. 1 taken from the left-hand side with a portion of the housing broken away;

[0009] FIG. 3 is an exploded view of the assembly of FIG. 1;

[0010] FIG. 4 is a perspective view of the valve of the present invention mounted in a section of an engine air inlet manifold; and,

[0011] FIG. 5 is a section view taken along section-indicating lines 5-5 of FIG. 4.

#### DETAILED DESCRIPTION OF THE INVENTION

[0012] Referring to FIGS. 1 through 3, the valve assembly of the present invention is indicated generally at 10 and includes a housing 12 which has a

motor drive unit 14 disposed therewithin which may include a speed reducer (not shown). The housing 12 preferably includes a mounting flange 16 having apertures 18, 20 formed therein for receiving therethrough suitable fasteners (not shown) for attachment to an intake manifold as will hereinafter be described.

[0013] Mounting flange 16 has mounted thereover a cap 22 which has formed therein an electrical receptacle shell 24 which has electrical terminal pins 26, 28 disposed therein for external electrical connection thereto. The terminal pins are internally connected by suitable electrical leads (not shown) to motor drive 14. Cap 22 also has apertures 30, 32 formed therein located to coincide with apertures 18, 20 of the flange 16 for receiving suitable mounting fasteners (not shown) therethrough.

[0014] Flange 16 preferably has a pair of spaced raised bosses 34, 36 formed thereon, each of which has therethrough a hole adapted for receiving a fastener. Cap 22 has correspondingly located holes 38, 40 formed therein, each of which has received therethrough a suitable fastener denoted 42, 44 respectively. In the present practice of the invention fasteners 42, 44 comprise rivets; however, it will be understood that other suitable types of fasteners may be employed as, for example, screws with retaining nuts or self-tapping fasteners.

[0015] The housing has a shaft 46 received through an unshown opening provided in the lower end of an extension 48 formed on the bottom of housing 12; and, it will be understood that the shaft 46 is operatively engaged with the motor drive 14 which may include a suitable speed reducer (not shown). The lower end of the shaft 46 preferably has driving surfaces 50 provided thereon such as, for example, a knurled surface or splines. It will be understood however that other configurations may be employed such as a hexagonal or square in cross-section configuration.

[0016] A vane type valve member 52 has a central hub 54 into which is received the lower end of shaft 46, it being understood, that hub 54 has provided therein suitable surfaces corresponding to the driving surfaces 50 on the shaft for transmitting torque from the shaft to the vane. In the present practice of the

invention, vane 52 and hub are formed integrally as one piece, such as by molding, and preferably, has a plurality of radially outwardly extending stiffening ribs 56 formed thereon.

[0017] The lower edge of the vane 52 has provided thereon, on opposite sides of the hub 54, a pair of oppositely directed baffles or baffling surfaces 58, 60 which may be formed by an offset or flap formed on the bottom edge of the vane. The baffling surfaces 58, 60 function in a manner as will be hereinafter described.

[0018] Referring to FIGS. 4 and 5, the valve assembly 10 is shown installed on an engine intake manifold having a portion thereof illustrated and denoted by reference numeral 62 and which has formed therein an auxiliary or secondary pressure pulse communication passage 64 having a typical rectangular cross-section as shown in FIG. 4.

[0019] The passage 64 has provided therein and disposed peripherally thereabout a raised rib 66 which has one edge thereof forming a seating surface denoted 68 for vane 52, which is shown in the fully open position in FIG. 4. With continuing reference to FIG. 4, the vane 52 is shown in the fully open position; and, when engine operating conditions require, an unshown controller energizes the motor drive unit which causes the vane to rotate in a clockwise direction to the closed position causing the baffling surface 60 to move to a post-adjacent rib 66; and, surfaces 58, 60 thereby provide baffling of the pressure pulse communication between the vane 52 and the rib minimizing pressure pulse building effects around the vane.

[0020] It will be understood that the assembly 10 is retained on the manifold by suitable fasteners (not shown) in FIGS. 1 through 4 received through the mounting hole 30, 32 and holes 18, 20 in the flange 16. The fasteners are shown in cross-section and denoted by reference numerals 70, 72 in FIG. 5. The aperture or mounting hole through which the assembly 10 is received in the manifold is denoted in FIG. 5 by reference numeral 74.

[0021] Referring to FIG. 3, upon installation of assembly 10 into opening 74,

the undersurface of flange 16 is sealed about the access hole 74 by a suitable seal ring denoted by reference numeral 76.

[0022] The present invention thus provides a simple and relatively low-cost, easy to assemble, rotary servo operated valve for controlling pressure pulse communication in an engine manifold passage which may be assembled externally through an opening formed in the manifold and provides for sufficient baffling of the pressure pulse communication when the valve is in the closed position to minimize pressure pulse communication or leakage thereabout.

[0023] Although the invention has hereinabove been described with respect to the illustrated embodiments, it will be understood that the invention is capable of modification and variation and is limited only by the following claims.